

I CLAIM:

1. An improvement to a spread-spectrum system having a base station and a plurality of remote stations (RS), with said base station (BS) having a BS-spread-spectrum transmitter for transmitting a plurality of BS-spread-spectrum signals at a first frequency and a BS-spread-spectrum receiver for receiving, at a second frequency, a plurality of RS-spread-spectrum signals from said plurality of remote stations, with the plurality of BS-spread-spectrum signals at the first frequency outside a correlation bandwidth of the plurality of RS-spread-spectrum signals at the second frequency, with each of said plurality of remote stations having an RS-spread-spectrum transmitter for transmitting an RS-spread-spectrum signal at the second frequency, the improvement comprising:

a BS transmitter, located at said base station, for transmitting a BS-channel-sounding signal at the second frequency, with the BS-channel-sounding signal having a bandwidth no more than twenty per cent of the spread-spectrum bandwidth of the plurality of RS-spread-spectrum signals;

each of said plurality of remote stations including an RS receiver, for receiving the BS-channel-sounding signal at the second frequency, each RS receiver having,

an RS demodulator for tracking the BS-channel-sounding signal, thereby outputting an RS-receiver signal;
a frequency-adjust circuit, coupled to said RS

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demodulator and responsive to the RS-receiver signal, for compensating to the second frequency the RS-spread-spectrum signal of said RS-spread-spectrum transmitter located at said remote station;

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each of said plurality of remote stations including an RS-power-level circuit, responsive to the RS-receiver signal, for adjusting an initial RS-power level of said RS-spread-spectrum transmitter located at said remote station; and

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an interference-reduction subsystem, located at said base station and at a front end to said BS-spread-spectrum receiver, for reducing, at the second frequency, the BS-channel-sounding signal from the RS-spread-spectrum signal arriving at said base station.

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2. An improvement to a spread-spectrum system having a base station and a plurality of remote stations (RS), with said base station (BS) having a BS-spread-spectrum transmitter for transmitting a plurality of BS-spread-spectrum signals at a first frequency and a BS-spread-spectrum receiver for receiving, at a second frequency, a plurality of RS-spread-spectrum signals from said plurality of remote stations, with the plurality of BS-spread-spectrum signals at the first frequency outside a correlation bandwidth of the plurality of RS-spread-spectrum signals at the second frequency, with each of said plurality of

remote stations having an RS-spread-spectrum transmitter for transmitting an RS-spread-spectrum signal at the second frequency, the improvement comprising:

15 a BS transmitter, located at said base station, for transmitting, using radio waves, a BS-channel-sounding signal at the second frequency, with the BS-channel-sounding signal having a bandwidth no more than twenty per cent of the spread-spectrum bandwidth of the plurality of RS-spread-spectrum signals;

20 each of said plurality of remote stations including an RS receiver, for receiving the BS-channel-sounding signal at the second frequency, each RS receiver having an RS demodulator for tracking the BS-channel-sounding signal, thereby outputting an RS-receiver signal;

25 each of said plurality of remote stations including an RS-power-level circuit, responsive to the RS-receiver signal, for adjusting an initial RS-power level of said RS-spread-spectrum transmitter located at said remote station; and

30 an interference-reduction subsystem, located at said base station and at a front end to said BS-spread-spectrum receiver, for reducing the BS-channel-sounding signal from the RS-spread-spectrum signal arriving at said base station.

3. An improvement to a spread-spectrum system having a base station and a plurality of remote stations (RS), with said base station (BS) having a BS-spread-spectrum transmitter for

transmitting a plurality of BS-spread-spectrum signals at a
first frequency and a BS-spread-spectrum receiver for receiving,
at a second frequency, a plurality of RS-spread-spectrum signals
from said plurality of remote stations, with the plurality of
BS-spread-spectrum signals at the first frequency outside a
correlation bandwidth of the plurality of RS-spread-spectrum
signals at the second frequency, with each of said plurality of
remote stations having an RS-spread-spectrum transmitter for
transmitting an RS-spread-spectrum signal at the second
frequency, the improvement comprising:

a BS transmitter, located at said base station, for
transmitting, using radio waves, a BS-channel-sounding signal at
the second frequency, with the BS-channel-sounding signal having
a bandwidth no more than twenty per cent of the spread-spectrum
bandwidth of the plurality of RS-spread-spectrum signals;

each of said plurality of remote stations including an
RS receiver, for receiving the BS-channel-sounding signal at the
second frequency, each RS receiver having,

an RS demodulator for tracking the BS-channel-sounding signal, thereby outputting an RS-receiver signal;

a frequency-adjust circuit, coupled to said RS demodulator and responsive to the RS-receiver signal, for compensating to the second frequency the RS-spread-spectrum signal of said RS-spread-spectrum transmitter located at said remote station; and

an interference-reduction subsystem, located at said
base station and at a front end to said BS-spread-spectrum
receiver, for reducing the BS-channel-sounding signal from the
RS-spread-spectrum signal arriving at said base station.

4. The improvement to the spread-spectrum system as set
forth in claim 1, 2 or 3, with said BS transmitter transmitting
the BS-channel-sounding signal at the second frequency, with the
BS-channel-sounding signal having a bandwidth no more than ten
per cent of the spread-spectrum bandwidth of the plurality of
RS-spread-spectrum signals.

5. The improvement to the spread-spectrum system as set
forth in claim 1, 2 or 3, with said BS transmitter transmitting
the BS-channel-sounding signal at the second frequency, with the
BS-channel-sounding signal having a bandwidth no more than five
per cent of the spread-spectrum bandwidth of the plurality of
RS-spread-spectrum signals.

6. The improvement to the spread-spectrum system as set
forth in claim 1, 2 or 3, with said BS transmitter transmitting
the BS-channel-sounding signal at the second frequency, with the
BS-channel-sounding signal having a bandwidth no more than one
per cent of the spread-spectrum bandwidth of the plurality of
RS-spread-spectrum signals.

7. An improvement to a spread-spectrum system having a base station and a plurality of remote stations (RS), with said base station (BS) having a BS-spread-spectrum transmitter for transmitting a plurality of BS-spread-spectrum signals at a first frequency and a BS-spread-spectrum receiver for receiving, at a second frequency, a plurality of RS-spread-spectrum signals from said plurality of remote stations, with the plurality of BS-spread-spectrum signals at the first frequency outside a correlation bandwidth of the plurality of RS-spread-spectrum signals at the second frequency, with each of said plurality of remote stations having an RS-spread-spectrum transmitter for transmitting an RS-spread-spectrum signal at the second frequency, the improvement comprising:

BS-transmitter means, located at said base station, for transmitting, using radio waves, a BS-channel-sounding signal at the second frequency, with the BS-channel-sounding signal having a bandwidth no more than twenty per cent of the spread-spectrum bandwidth of the plurality of RS-spread-spectrum signals;

each of said plurality of remote stations including RS-receiver means, for receiving the BS-channel-sounding signal at the second frequency, and for tracking the BS-channel-sounding signal, thereby outputting an RS-receiver signal;

each of said plurality of remote stations including

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RS-power-level means, responsive to the RS-receiver signal, for adjusting an initial RS-power level of said RS-spread-spectrum transmitter located at said remote station; and

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interference-reduction means, located at said base station and at a front end to said BS-spread-spectrum receiver, for reducing the BS-channel-sounding signal from the RS-spread-spectrum signal arriving at said base station.

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8. The improvement to the spread-spectrum system as set forth in claim 7, with said RS-receiver means at each of said plurality of remote stations further including compensating means, responsive to RS-receiver signal, for compensating to the second frequency the RS-spread-spectrum signal of said RS-spread-spectrum transmitter located at said remote station.

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9. The improvement to the spread-spectrum system as set forth in claim 7 or 8, with said BS transmitter transmitting the BS-channel-sounding signal at the second frequency, with the BS-channel-sounding signal having a bandwidth no more than ten per cent of the spread-spectrum bandwidth of the plurality of RS-spread-spectrum signals.

10. The improvement to the spread-spectrum system as set forth in claim 7 or 8, with said BS transmitter transmitting the BS-channel-sounding signal at the second frequency, with the BS-

10 channel-sounding signal having a bandwidth no more than five per cent of the spread-spectrum bandwidth of the plurality of RS-spread-spectrum signals.

15 11. The improvement to the spread-spectrum system as set forth in claim 7 or 8, with said BS transmitter transmitting the BS-channel-sounding signal at the second frequency, with the BS-channel-sounding signal having a bandwidth no more than one per cent of the spread-spectrum bandwidth of the plurality of RS-spread-spectrum signals.

5 12. A method for improving a spread-spectrum system having a base station and a plurality of remote stations (RS), with said base station (BS) having a BS-spread-spectrum transmitter for transmitting a plurality of BS-spread-spectrum signals at a first frequency and a BS-spread-spectrum receiver for receiving, at a second frequency, a plurality of RS-spread-spectrum signals from said plurality of remote stations, with the plurality of BS-spread-spectrum signals at the first frequency outside a correlation bandwidth of the plurality of RS-spread-spectrum signals at the second frequency, with each of said plurality of remote stations having an RS-spread-spectrum transmitter for transmitting an RS-spread-spectrum signal at the second frequency, the method comprising the steps of:

10 transmitting, using radio waves, from a BS

15 transmitter, located at said base station, a BS-channel-sounding
signal at the second frequency, with the BS-channel-sounding
signal having a bandwidth no more than twenty per cent of the
spread-spectrum bandwidth of the plurality of RS-spread-spectrum
signals;

20 receiving, at each of said plurality of remote
stations with an RS receiver, the BS-channel-sounding signal at
the second frequency;

tracking, at each of said plurality of remote stations
with an RS demodulator, a the BS-channel-sounding signal,
25 thereby generating an RS-receiver signal;

adjusting, in response to the RS-receiver signal, an
initial RS-power level of said RS-spread-spectrum transmitter
located at said remote station; and

reducing the BS-channel-sounding signal from the RS-
30 spread-spectrum signal arriving at said base station.

13. The method for improving the spread-spectrum system as
set forth in claim 12, further including the step of
compensating, in response to RS-receiver signal, to the second
frequency the RS-spread-spectrum signal of said RS-spread-
5 spectrum transmitter located at said remote station.

14. The method for improving the spread-spectrum system as
set forth in claim 12 or 13, with the step of transmitting the

BS-channel-sounding signal at the second frequency, including the step of transmitting the BS-channel-sounding signal with a bandwidth no more than ten per cent of the spread-spectrum bandwidth of the plurality of RS-spread-spectrum signals.

15. The method for improving the spread-spectrum system as set forth in claim 12 or 13, with the step of transmitting the BS-channel-sounding signal at the second frequency, including the step of transmitting the BS-channel-sounding signal with a bandwidth no more than one per cent of the spread-spectrum bandwidth of the plurality of RS-spread-spectrum signals.

16. The method for improving the spread-spectrum system as set forth in claim 12 or 13, with the step of transmitting the BS-channel-sounding signal at the second frequency, including the step of transmitting the BS-channel-sounding signal with a bandwidth no more than one per cent of the spread-spectrum bandwidth of the plurality of RS-spread-spectrum signals.

17. The method for improving the spread-spectrum system as set forth in claim 12 or 13, with the step of reducing the BS-channel-sounding signal further including the step of notch filtering the BS-channel-sounding signal from the plurality of RS-spread-spectrum signals.

18. The method for improving the spread-spectrum system as set forth in claim 14, with the step of reducing the BS-channel-sounding signal further including the step of notch filtering the BS-channel-sounding signal from the plurality of RS-spread-spectrum signals.

19. The method for improving the spread-spectrum system as set forth in claim 15, with the step of reducing the BS-channel-sounding signal further including the step of notch filtering the BS-channel-sounding signal from the plurality of RS-spread-spectrum signals.

20. The method for improving the spread-spectrum system as set forth in claim 16, with the step of reducing the BS-channel-sounding signal further including the step of notch filtering the BS-channel-sounding signal from the plurality of RS-spread-spectrum signals.

21. An improvement to a spread-spectrum system having a plurality of base stations covering a geographic area, with each base station communicating within a geographic cell with a plurality of remote stations (RS), with each base station (BS) having a BS-spread-spectrum transmitter for transmitting a plurality of BS-spread-spectrum signals at a first frequency and a BS-spread-spectrum receiver for receiving, at a second

frequency, a plurality of RS-spread-spectrum signals from said plurality of remote stations, with the plurality of BS-spread-spectrum signals at the first frequency outside a correlation bandwidth of the plurality of RS-spread-spectrum signals at the second frequency, with each of said plurality of remote stations having an RS-spread-spectrum transmitter for transmitting an RS-spread-spectrum signal at the second frequency, the improvement comprising:

a BS transmitter, located at each base station, for transmitting a BS-channel-sounding signal at the second frequency, with the BS-channel-sounding signal transmitted within a respective time slot assigned to the respective BS transmitter, and having a bandwidth no more than twenty per cent of the spread-spectrum bandwidth of the plurality of RS-spread-spectrum signals;

each of said plurality of remote stations including an RS receiver, for receiving the BS-channel-sounding signal at the second frequency, each RS receiver having,

an RS demodulator for tracking the BS-channel-sounding signal, thereby outputting an RS-receiver signal;

a frequency-adjust circuit, coupled to said RS demodulator and responsive to the RS-receiver signal, for compensating to the second frequency the RS-spread-spectrum signal of said RS-spread-spectrum transmitter located at said remote station;

each of said plurality of remote stations including an RS-power-level circuit, responsive to the RS-receiver signal, for adjusting an initial RS-power level of said RS-spread-spectrum transmitter located at said remote station; and

an interference-reduction subsystem, located at said base station and at a front end to said BS-spread-spectrum receiver, for reducing, at the second frequency, the BS-channel-sounding signal from the RS-spread-spectrum signal arriving at said base station.

22. An improvement to a spread-spectrum system having a plurality of base stations covering a geographic area, with each base station communicating within a geographic cell with a plurality of remote stations (RS), with each base station (BS) having a BS-spread-spectrum transmitter for transmitting a plurality of BS-spread-spectrum signals at a first frequency and a BS-spread-spectrum receiver for receiving, at a second frequency, a plurality of RS-spread-spectrum signals from said plurality of remote stations, with the plurality of BS-spread-spectrum signals at the first frequency outside a correlation bandwidth of the plurality of RS-spread-spectrum signals at the second frequency, with each of said plurality of remote stations having an RS-spread-spectrum transmitter for transmitting an RS-spread-spectrum signal at the second frequency, the improvement comprising:

a BS transmitter, located at each base station, for transmitting a BS-channel-sounding signal at the second frequency, with the BS-channel-sounding signal transmitted within a respective time slot assigned to the respective BS transmitter, and having a bandwidth no more than twenty per cent of the spread-spectrum bandwidth of the plurality of RS-spread-spectrum signals;

each of said plurality of remote stations including an RS receiver, for receiving the BS-channel-sounding signal at the second frequency, each RS receiver having an RS demodulator for tracking the BS-channel-sounding signal, thereby outputting an RS-receiver signal;

each of said plurality of remote stations including an RS-power-level circuit, responsive to the RS-receiver signal, for adjusting an initial RS-power level of said RS-spread-spectrum transmitter located at said remote station; and

an interference-reduction subsystem, located at said base station and at a front end to said BS-spread-spectrum receiver, for reducing, at the second frequency, the BS-channel-sounding signal from the RS-spread-spectrum signal arriving at said base station.

23. An improvement to a spread-spectrum system having a plurality of base stations covering a geographic area, with each base station communicating within a geographic cell with a

plurality of remote stations (RS), with each base station (BS)
5 having a BS-spread-spectrum transmitter for transmitting a
plurality of BS-spread-spectrum signals at a first frequency and
a BS-spread-spectrum receiver for receiving, at a second
frequency, a plurality of RS-spread-spectrum signals from said
plurality of remote stations, with the plurality of BS-spread-
10 spectrum signals at the first frequency outside a correlation
bandwidth of the plurality of RS-spread-spectrum signals at the
second frequency, with each of said plurality of remote stations
having an RS-spread-spectrum transmitter for transmitting an RS-
spread-spectrum signal at the second frequency, the improvement
15 comprising:

a BS transmitter, located at each base station, for
transmitting a BS-channel-sounding signal at the second
frequency, with the BS-channel-sounding signal transmitted
within a respective time slot assigned to the respective BS
20 transmitter, and having a bandwidth no more than twenty per cent
of the spread-spectrum bandwidth of the plurality of RS-spread-
spectrum signals;

each of said plurality of remote stations including an
RS receiver, for receiving the BS-channel-sounding signal at the
25 second frequency, each RS receiver having,

an RS demodulator for tracking the BS-channel-
sounding signal, thereby outputting an RS-receiver signal;
a frequency-adjust circuit, coupled to said RS

demodulator and responsive to the RS-receiver signal, for
compensating to the second frequency the RS-spread-spectrum
signal of said RS-spread-spectrum transmitter located at
said remote station; and

an interference-reduction subsystem, located at said
base station and at a front end to said BS-spread-spectrum
receiver, for reducing, at the second frequency, the BS-channel-
sounding signal from the RS-spread-spectrum signal arriving at
said base station.

24. The improvement to the spread-spectrum system as set
forth in claim 21, 22, or 23, with said BS transmitter
transmitting the BS-channel-sounding signal at the second
frequency, with the BS-channel-sounding signal having a
bandwidth no more than ten per cent of the spread-spectrum
bandwidth of the plurality of RS-spread-spectrum signals.

25. The improvement to the spread-spectrum system as set
forth in claim 21, 22, or 23, with said BS transmitter
transmitting the BS-channel-sounding signal at the second
frequency, with the BS-channel-sounding signal having a
bandwidth no more than five per cent of the spread-spectrum
bandwidth of the plurality of RS-spread-spectrum signals.

26. The improvement to the spread-spectrum system as set

forth in claim 21, 22, or 23, with said BS transmitter transmitting the BS-channel-sounding signal at the second frequency, with the BS-channel-sounding signal having a bandwidth no more than one per cent of the spread-spectrum bandwidth of the plurality of RS-spread-spectrum signals.

27. The method for improving the spread-spectrum system as set forth in claim 1, 2 or 3, with said interference-reduction subsystem including a notch filter for notch filtering the BS-channel-sounding signal from the plurality of RS-spread-spectrum signals.

28. The method for improving the spread-spectrum system as set forth in claim 4, with said interference-reduction subsystem including a notch filter for notch filtering the BS-channel-sounding signal from the plurality of RS-spread-spectrum signals.

29. The method for improving the spread-spectrum system as set forth in claim 5, with said interference-reduction subsystem including a notch filter for notch filtering the BS-channel-sounding signal from the plurality of RS-spread-spectrum signals.

30. The method for improving the spread-spectrum system as

set forth in claim 6, with said interference-reduction subsystem including a notch filter for notch filtering the BS-channel-sounding signal from the plurality of RS-spread-spectrum signals.

31. The method for improving the spread-spectrum system as set forth in claim 7 or 8, with said interference-reduction means including a notch filter for notch filtering the BS-channel-sounding signal from the plurality of RS-spread-spectrum signals.

32. The method for improving the spread-spectrum system as set forth in claim 9, with said interference-reduction means including a notch filter for notch filtering the BS-channel-sounding signal from the plurality of RS-spread-spectrum signals.

33. The method for improving the spread-spectrum system as set forth in claim 10, with said interference-reduction means including a notch filter for notch filtering the BS-channel-sounding signal from the plurality of RS-spread-spectrum signals.

34. The method for improving the spread-spectrum system as set forth in claim 11, with said interference-reduction means

including a notch filter for notch filtering the BS-channel-sounding signal from the plurality of RS-spread-spectrum signals.